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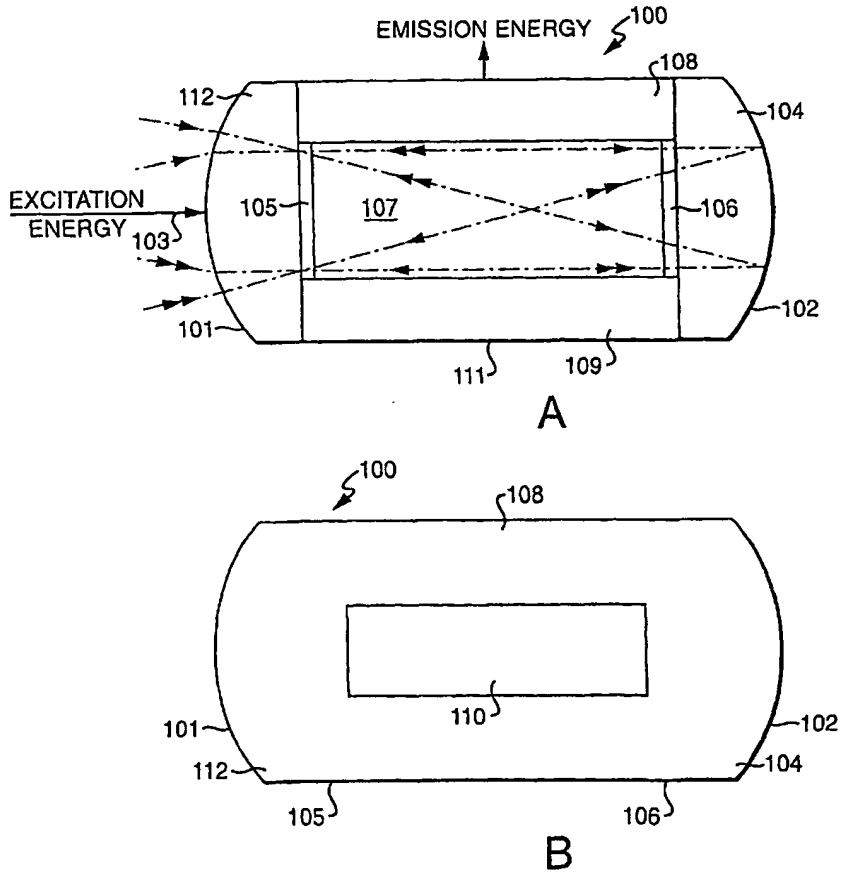
(54) Title: FLUORESCENCE DETECTOR GEOMETRY



(57) Abstract: Excitation light (103) of a selected wavelength from an excitation monochromator is directed along the long axis of a flow cell (100) containing the sample to be analyzed, generating fluorescence. An emission monochromator is positioned at right angles to the plane of the excitation monochromator and receives the fluorescence from the flow cell (100) utilizing optical components positioned such that the entrance slit of the emission monochromator is aligned with the long axis of the emission window. The intensity of the output from the flow cell (100) is further maximised by positioning a retro-reflecting mirror (104) at the end of the flow channel (107) to effectively double the path-length of the excitation beam, and a reflecting surface on the side of the cell opposite the emission window to increase the collection efficiency and thereby increase the sensitivity of the detector.

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FLUORESCENCE DETECTOR GEOMETRY

Related Applications

This application claims priority from U.S. Provisional Application 60/273,093, filed March 2, 2001.

Field of the Invention

The present invention relates to fluorescence detectors, and more particularly to an axially illuminated flow cell having a significantly greater excitation path length per unit volume allowing for improved sensitivity.

Background of the Invention

In the measurement of fluorescence and exitation spectra it is customary to illuminate a sample with monochromatic light from an intense source and to observe the fluorescence emitted by the sample with a monochromator and a photoelectric detection system.

Conventional fluorescence detectors are based on monochromators and an incoherent light source that have essentially the same geometry. Both excitation and emission monochromators lie in the same plane. The cuvette or flow cell is illuminated with excitation light on one side and fluorescence is collected at right angles. The slits of the excitation and emission monochromators are aligned with the long axis of the cell that is perpendicular to the plane of the optics. The cross-section of the cell of conventional detectors in the plane of the optics is typically square.

Standard detection flow cells used in conventional liquid chromatography instruments have the disadvantage that their cell pathways, as a function of their design, are unfortunately short. The width of the emission face of the cell is mapped by collection optics onto the width of the emission monochromator entrance slit. The desired spectral resolution sets a limit to the width of the emission slits, and therefore to the width of the flow cell or cuvette. An exciting beam of light is transmitted through the flow cell to cause fluorescent emission. The amount or intensity of the fluorescent emission is in direct relationship with the path-length of the exciting beam within the sample. As sample